DOCUMENT RESUME

ED 249 369 CE 039 789

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TITLE An Effective Strategy to Design Mediated Instruction for Female Adults--Compositional Syntactic Placement.
PUB DATE Nov 84
NOTE 55p.; Paper presented at the National Adult Education Conference (Louisville, KY, November 6-10, 1984).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Adult Education; *Adult Students; *Cerebral Dominance; Concept Formation; *Educational Television; Encoding (Psychology); *Females; *Field Dependence Independence; Learning Modalities; Learning Strategies; Postsecondary Education; Production Techniques; Television Research; *Visual Learning; Visual Stimuli; Womens Education; Workshops
IDENTIFIERS *Compositional Syntactic Placement

ABSTRACT

This research was conducted to examine the theoretical basis and findings of an experiment on televised adult instruction. The media coding system element, compositional syntactic placement, was investigated for potential aptitude-treatment interactions on a simple concept learning task. Compositional syntactic placement may be conceptualized as the relative horizontal position of the primary symbol or object within the frame--left, central, or right. Women who were participants in a nonformal workshop viewed a visual stimulus set within a videotaped program in either a left (n = 50), right (n = 50), or central (n = 52) syntactic placement orientation. The instruments used to measure selected learner aptitudes were (1) the Group Embedded Figures Test for field articulation, (2) the Productive Ability Test for general intelligence ability, and (3) the Edinburgh Handedness Inventory for hemispheric dominance. The dependent variable, pretest-posttest difference scores, was assessed with 22-question instruments. Analysis of variance and multiple comparison techniques indicated compositional syntactic placement increased very significantly simple concept learning ($p<.0001$), and aptitude-treatment interactions were noted ($p<.05$). The conclusion of this study suggests that there is substantial support for Salomon's supplantation theory, where the choice of specific coding elements within a symbol system may affect the ease with which information is processed by a learner with different aptitude levels. (Author/KC)

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# An Effective Strategy To Design Mediated Instruction For Female Adults--Compositional Syntactic Placement

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A paper presented at the national conference of the
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Louisville, Kentucky, November, 1984

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ABSTRACT

The purpose of this research was to examine the theoretical basis and findings of an experiment on televised adult instruction. The media coding system element, compositional syntactic placement, was investigated for potential aptitude-treatment interactions on a simple concept learning task. Compositional syntactic placement may be conceptualized as the relative horizontal position of the primary symbol or object within the frame--left, central, or right. Female subjects who were participants in a nonformal workshop viewed a visual stimulus set within a videotaped program in either a left ($n$ = 50), right ($n$ = 50), or central ($n$ = 52) syntactic placement orientation. The instruments used to measure selected learner aptitudes were: (a) the Group Embedded Figures Test for field articulation, (b) the Predictive Ability Test for general intelligence ability, and (c) the Edinburgh Handedness Inventory for hemispheric dominance. The dependent variable, pretest-posttest difference scores, was assessed with 22-question instruments. Analysis of variance and multiple comparison techniques indicated compositional syntactic placement increased very significantly simple concept learning ($p<.0001$), and aptitude-treatment interactions were noted ($p<.05$). The conclusion of this study suggests that there is substantial support for Salomon's supplantation theory, where the choice of specific coding elements within a symbol system may affect the ease with which information is processed by a learner with different aptitude levels.

Author Notes

This research was conducted while the author was located at Mercer University in Macon, Georgia, and was reported originally in a doctoral dissertation completed at the University of Wyoming in May, 1984.

An Effective Strategy To Design Mediated Instruction
For Female Adults--Compositional Syntactic Placement

This study was undertaken in an effort to provide new information on the nature of adult learning facilitated by instructional media. Formal and nonformal adult education has long looked to audiovisual media to deliver instruction to the inaccessible learner (Johnson, 1970; Robinson, 1974); however, little or no research exists to aid the field in the design of effective learning experiences. Most of the studies involving the use of educational technology in adult education have been in the area of evaluation, not experimental research (Ely, 1981). In a review of research on audiovisual media used to teach adults, Campeau (1971) identified over 1,200 research references in the international literature. Only about a dozen studies were found to meet established standards of experimental research, and most of those dealt with programmed instruction.

Cohen, Ebling, and Kulik (1981) also noted the poor quality of research on instructional media and the lack of adult subjects. In an attempt to synthesize the findings of visual-based instruction and clarify the trend of no significant differences in comparisons of televised with face-to-face instruction (e.g., Chu & Schramm, 1967; Kumata, 1956), they applied meta-analytic techniques to studies reported in the literature. Meta-analysis is simply the analysis of analyses, or more formally, the statistical analysis of a large collection of results from individual studies for the purpose of integrating findings. Of over 14,000 titles identified, only 72 were free of major methodological flaws, included postsecondary subjects, and measured student outcomes. While the effect size was small--1.5 percentage points--student achievement was significantly better under visual-based instruction than conventional teaching.

After three decades of research emphasis on the relative effectiveness of electronic media versus conventional instruction and the comparison of one medium versus another, the inquiry has become more sharply focused (Wilkinson, 1980). Recent academic interest in interactive cognitive effects and the symbolic coding systems of media has now provided a theoretical paradigm for research inquiries into aptitude treatment-interaction questions (Clark, 1975; Cronbach, 1957; Cronbach & Snow, 1977; Salomon, 1979; Salomon & Clark, 1977; Snow & Salomon, 1968). For example, questions can be formulated on how syntactic coding elements within a media's symbol system are related to differences among requisite mental skills for knowledge acquisition when content is held constant. Richardson (1983) has called for the utilization of this theoretical construct with television-centered instruction for adults.

Symbol Systems

As Salomon (1979) notes, the reason for focusing on media's symbol systems is twofold. First, it can be argued that media's symbol systems or "modes of appearance" are the primary of most essential attributes of media. Symbol systems as "modes of appearance" consist of sets of elements (figures, lines, dots) that are used in specifiable ways in relation to fields of reference (Goodman, 1968). In this view, languages, pictures, television, film, graphs, the table of chemical elements, the theorems of Euclidean proofs, and the arts are all symbol systems insofar as they are means of reference. Second, all cognition and learning are based on internal symbolic representations. Cognition is conceptualized by most contemporary psychologists as the process that enables an individual to represent and deal symbolically with the external environment (Rosenthal & Zimmerman, 1978). Olson (1974) and Olson and Bruner (1974) have argued that one of the primary goals of education should be to

cultivate learners' symbolic skills. This echoes an idea expressed earlier by Piaget and Inhelder (1971, p. 381) that "without some semiotic means it would be impossible to think at all." Consequently, the choice of media's symbol systems as the focus for investigation stems from the potentially rich interactions among media symbols, thinking, and learning.

Under the information processing model which underlies the aptitude and task cognitive processing approach, the acquisition of knowledge from a coded message is mediated by skills of information reception and processing (Bovy, 1981). These skills are significantly affected by the specific nature of each symbol system into which the content of the message is coded. Thus, each medium, using symbol systems may have its own specific effects on how the knowledge is extracted and on how meanings are derived. The ease or difficulty of processing coded information is not limited to differences among whole symbol systems. The choice of specific coding elements within a symbol system may effect the ease with which information is learned (Salomon, 1979). Some coding elements can save mental activity and ease the processing burden on unskilled learners. Skilled learners, on the other hand, may show a decrement in cognitive processing (Cronbach & Snow, 1977). As Gagné (1980, p. 7) noted, "In developing programs in instruction, one must solve the problem of lesson design and media selection by reference to mental states and mental processes rather than simply in terms of behavioral outcomes."

Many symbol systems within media have the potential to facilitate or debilitate learning by calling upon different processing strategies. Following Goodman (1968), one can examine film as well as television as a meeting place of multiple-symbol schemes and as a meeting place of multiple-symbol systems.

As a scheme, film and television entail a number of levels of articulation: the shot, the sequence, the syntagm, the whole program. Each of these requires its own rules and conventions of articulation that pertain to the transformation and composition of events, objects, and relations over time and space. These modes of articulation--that is syntaxes--need not be the same for all levels of articulation. The way a single shot is composed differs from the way a whole sequence of shots is composed.

Kjørup (1977) provides a sample of such compositional syntaxes. At the level of the single shot, one finds that the conventions of spatial composition determine, for instance, that an object seen from below is increased in importance, and an object seen from above is decreased in importance. At the level of the sequence, the progression of a person seen looking to the right, followed by a shot of a dish followed by a shot of a clock, accompanied by rapid music, and followed by his wife standing nervously at a bus station, communicates a different message from the same shots arranged in a different order. Other, more complex, conventions govern the composition of sequences into syntagms and the syntagms into a whole program. Christian Metz (1974) has offered a scheme of eight types of larger units (autonomous segments) that can be identified in feature films and television programs. These segments constitute a whole system based on six dichotomies--e.g., sequenses of single shots versus sequences of intercut shots; parallel sequences to show comparison or contrast; parenthetical sequences to show different aspects of the same situation; and so on.

Of the many symbol system elements, this study focused on the significance of the coding syntax of symbols within a shot, compositional syntactic placement. It is generally held that the location of objects within a frame affects such aspects as the balance of the image, the level of attention given the object

within the field, the vitality of the image, and even the interpretation of the object itself. An object located near the top is thought to be relatively light, perhaps floating; placed low, it is seen as becoming heavy, as if dropping. For example, when a baloon is located low or a bowling ball high, one finds the image vaguely unsettling (Fabri, 1970). Related perceptual conclusions are initiated by the implied movement of an object or by the directional forces within the image toward or away from the frame (Zettl, 1973).

Further, the placement of objects on the right side rather than the left side of the screen differentially affects a viewer's perception of the object. Zettl (1973) has defined this concept as "asymmetry of the screen", and it is derived from earlier works by Dean (1946), Wölfflin (1944), Mascelli (1965), and Arnheim (1954). This principle of asymmetry has also been discussed by Dondis (1973) and Millerson (1966). While there is general agreement that the right and left sides of a visual field are perceived differently, there is no unanimity as to which side is more important in attracting a viewer's attention. Neurophysiological studies, although somewhat ambiguous, suggest that the left visual field is more conducive to presentations of visual material, since the right hemisphere of the brain is responsible for processing figural symbol systems (Gazzaniga, 1974; Gardner, 1977). On the other hand, media aestheticians tend to support generally Joseph V. Mascelli's (1965, p. 224) contention that "the most important player, object or action should generally be positioned on the right".

Research on Syntactic Placement

Unfortunately, empirical research quantifying the elements of the composition of images presented by television and film is lacking. While some research

has been reported, none has shown any cogently significant difference on aesthetic or learning variables in the placement of elements within the frame. Difficulties with measurement and test stimuli have precluded any measurable results. Using a Likert-type scale, Metallinos (1975) and Metallinos and Tiemens (1977) measured viewer perception of weight, importance, prominence, attractiveness, and interest value of visuals during a newscast; however, none of these variables were significant. Close examination of the experimental treatments used in these two studies suggests that some cases which favored placement of the visuals on the left side of the screen may have been inversely related to size. That is, some visuals which were placed on the left side of the screen may have appeared smaller than the same visuals when placed on the right side of the screen. Data from a visual retention test did show some evidence to suggest that visual information in a newscast is enhanced when the visual elements are placed on the left side of the screen.

The Metallinos study stimulated additional quantitative research such as that conducted by Avery and Tiemens (1975). Although they found no significant difference in the perception of visual elements placed on the left or right side of the screen, they confirmed that the semantic differential is a more accurate technique for measuring aesthetic dimensions than is the Likert scale technique and, therefore, is preferable. Another experimental study on the subject of asymmetry employed a different quantitative research approach (Fletcher, 1977). Although that study confirmed the left and right asymmetry of visual elements within the frame, it did not determine which side of the frame (left or right) is predominant as the preferred choice. Herbener, Van Tubergen, and Whitlow's (1979) experimental study developed a scale that would measure with reasonable precision semantic values of various placements-

within-frame (independent of object meaning). Unfortunately, their stimuli set only included six of the nine subdivisions of the frame that were created. Subjects considered images more active and potent when the center of interest was higher in the frame and tended to rate the image more negatively on the evaluative scale (i.e., increased emotional tension) when the center of interest was placed away from the geometric center of the frame.

Again using a newscast display format, Metallinos (1980) presented to subjects 20 color slides taken from a videotape containing short stories in international, national, and local news. A newscaster was placed either on the left or right of the visual field while the other side was proportionally balanced with the placement of visuals specifically designed for the study. When tested after each slide was exposed for ten seconds, subjects were able to describe the shape ($p<.01$), to perceive color ($p<.001$), and to recall ($p<.02$) visual stimuli placed on the left side of the screen better than those placed on the right. Unfortunately, the study employed a small number of subjects ($N = 47$) and utilized no control group for central image placement. In addition, image placement's affect upon news content retention was not evaluated, and test sensitization may have been a plausible rival hypothesis due to the multiple time-series design employed.

Hypothesizing that cultural protocols may have an affect with respect to the perception of asymmetry, Fletcher (1980) tested groups of 71 Afro Americans and 71 Anglo Americans with slides of four landscapes in both left and right orientations. Magnitude estimation scores for each version of each landscape were analyzed using a three-way analysis of variance (cultural group x landscape x asymmetry). No significant differences were noted for left or right asymmetry preference, but there were significant differences in the way each cultural

group perceived the landscapes ($p<.005$). Afro Americans found right asymmetry more attractive while Anglo Americans found left asymmetry more attractive. Differences were also noted in how the landscapes were viewed in relation to one another ($p<.001$). Regrettably, these differences may point to poor selection of visual stimuli. That is, other compositional factors may have confounded subject estimation. This, coupled with the limited number of stimuli, questions the relevance of the entire experiment.

Departing radically from the previous studies, Niekamp (1981) employed ocular photography and stimulus visuals consisting of a circle appearing in each quadrant of the screen. Six subjects viewed the stimulus materials and were filmed with an eye movement recording system. While the results indicated that the upper half of the visual field had inherently greater visual weight than the lower half ($p<.01$), the study failed to produce sufficiently reliable data to confirm any left or right preference. The combined mean totals favored the right, but the differences were small and lacking in reliability, "leaving the status of comparative left-right visual weights in its current unsettled state" (p. 146). In conclusion, Niekamp noted:

> ...the data were less encouraging about revealing the nature and directions of any left-right differences in visual weight, and did, in fact, merely reflect the conflicting views and uncertain results found in the theoretical and research literature. But from these data, and those yielded by previous limited research, certain conclusions may be drawn: that existing differences in left-right visual weight are less pronounced (but not necessarily less significant) than those existing between top and bottom; that these differences may be a function of and are affected by individual human differences; and that revealing the differences in left-right visual weight, together with factors influencing these differences, will require more subtle research procedures (p. 147).

Cognitive Abilities

An important reason for this disappointing lack of progress may lie in the failure to analyze the impact of the treatments on the internal psychological processing operations of the individual. Educational media research has been faulted, as a whole, in this respect (Bovy, 1981). An instructional treatment that is unprocessed by learners cannot be expected to have a positive impact on learning. Snow and Salomon (1968) have pointed out that individual aptitudes in the areas of intellectual abilities, cognitive styles and preferences, learning sets, information processing and coding strategies, and other subtle experimental variables are likely to interact in many complex ways with variables reflecting the design of visual stimuli. Some evidence exists that three variables may have the potential to affect learning from a media coding system element: hemispheric dominance, field articulation, and predictive ability.

Hemispheric Dominance. Studies of people with unilateral lesions, with total forebrain commissurotomy, and with intact neurological function all confirm that in the typical right-handed individual, though the left hemisphere is predominant for verbal functions, the right hemisphere is predominant for visuo-spatial tasks, including spatial relations, spatial location, visual matching, face recognition, and imagistic encoding (Kinsbourne & Hiscock, 1978; Wittrock, 1978). Visuo-spatial processing or the expectancy of it arouses the right hemisphere, biasing attention toward and awareness of the left half of space, so that even if sensory input is not strictly confirmed to one side of the brain, nevertheless, a lateral bias in attention ensues (Gilbert & Bakan, 1973; Nelson & MacDonald, 1971; Levy & Trevarthen, 1976). None of the research directly addresses determinates of preference for compositional

syntactic placement within pictures, nor even whether cerebral lateralization plays any role at all in aesthetic choice or learning from visual media. However, it is quite conceivable that if an asymmetrical inherent biasing of attention into the left half of space during visual perception exists, those pictures which tend to correct for this imbalance by having the center of focus, or most important content, on the right, would be perceived as the more aesthetically pleasing or informative. On the other hand, it is possible that perceived balance is less important in determining aesthetic perference or learning, than is congruence between the focus of interest in a picture and field of greater attention. If so, preferred pictures would be those with the important content on the left. Tentatively supporting the former hypothesis, Levy (1976) has published some results indicating self-reported right-handers when viewing mirror-symmetric pictures activate the right visuo-spatially specialized hemisphere, producing a bias of attention toward and a pychological weighting of the left side of space. Pictures which corrected for this imbalance by having their important content or greater heaviness on the right were considered, for this reason, to be more aesthetically pleasing by subjects. Left-handers, however, unlike right-handers, display quite variable perference.

Field Articulation. In a typical visual concept-attainment task, learners are required to distinguish examples from nonexamples of each concept class. To complete this task successfully, a learner needs the aptitude capacity to discriminate small visual details which characterize each concept example and to structure this information as generalizable rules which may be utilized in classifying examples as members of a concept class (Gagné, 1977). Learners

appear to differ in their ability to discriminate and generalize, and the cognitive style construct, field articulation (field independence vs. field dependence), has been related empirically to these differences (Witkin, Oltman, Raskin & Karp, 1971). Research findings have indicated typical concept-attainment tasks are often more demanding for field-dependent individuals (Dickstein, 1968; Kirschenbaum, 1968; Witkin, Moore, Goodenough & Cox, 1977).

Individuals who are perceptually field-dependent have been found to experience their world in a less differentiated fashion when dealing with perceptual and cognitive tasks (Witkin, Goodenough & Oltman, 1977; Witkin & Goodenough, 1976). The field-dependent learner tends to rely on external referents which influence the strategies used in concept attainment tasks. That is, field-dependent persons tend to accept the visual field passively as presented and tend to ignore important details which presumably are not salient to them. Their tendency to display less differentiated functioning is also evident in the processing strategies they use when directed to form a concept hypothesis. Their hypothesis-testing strategy has been associated with a partist approach which lacks organizations (Goodenough, 1976; Kirschenbaum, 1968). The field-dependent learner tends to form one concept hypothesis at a time based on the most noticeable or salient features of the concept example. If subsequent examples reveal that the hypothesis is not valid, then new features are chosen, and a new hypothesis is formed. If subsequent examples substantiate these features, then the hypothesis is retained (Goodenough, 1976). In other words, the field-dependent tends to note passively the dominant, salient cues, until it becomes obvious that certain features are associated with positive examples of the concept (Witkin, Moore, Goodenough & Cox, 1977).

This strategy may be contrasted with that of the field-independent learners. These learners are capable of more differentiated functioning. That is, they are capable of using their restructuring skills as internal mediational processes (Witkin, Moore, Goodenough & Cox, 1977). Their hypothesis-testing strategies have been associated with a wholist approach which imposes organization (Goodenough, 1976; Kirschenbaum, 1968). Frederick (1968) noted that only the more analytic learners were sensitive to amounts of relevant information. The field-independent learner tends to scan the first positive concept example, and to retain all its attributes for later comparison with those in subsequent examples. If the hypothesis is proven to be inappropriate, then a revised hypothesis is formed. The wholist strategy of hypothesis testing is more active than the partist approach, and has resulted in better learning performance, particularly when subjects were under time pressure (Bruner, Goodnow & Austin, 1956; Bourne, 1966).

In his discussion of hypothesis-testing strategies, Mayer (1977) pointed out that the superiority of the wholist strategy could be due to its reduced demands on memory. The wholist has only to remember the attributes of the first example. Subsequent checks against examples reduce the memory requirement, because the wholist is able to eliminate those attributes which fail to reappear. Conversely, the memory demands for the partist strategy will increase with each wrong hypothesis. Subsequent new hypotheses will need to incorporate a record of all prior hypotheses that were disproven, to avoid using them twice. In sum, field-dependent learners may be handicapped by unstructured materials and a lack of salient, relevant details upon which to base their hypothesis. The difficulty of field-dependent learners may be particularly apparent when

instructional time is limited by a fixed-paced presentation. Pishkin (1965) has suggested that specification of concept attributes, in some manner, may reduce learning difficulty for field-dependent individuals by reducing the number of hypotheses to be considered.

Predictive Ability. The Predictive Ability Test was developed in the context of a theory of behavior which proposes that general ability can be estimated by the measurement of predictive ability (Friedman, 1974). General ability (G) is a complex measure. The hierarchical model of ability organization, as interpreted by Cattell (1971), has at its highest level a distinction between fluid-analytic intelligence ($G_f$) and crystallized-verbal intelligence ($G_c$). After decades of factor analytic debate, this or related hierarchical views have finally become popular because they fit existing data rather well while offering some hope of parsimony (Snow, 1977, 1980). Horn (1976) summarized much recent correlational research under these rubrics, adding spatial visualization ability ($G_v$) to the general level. Cronbach and Snow (1977) adopted such a hierarchical view in attempting to make sense of a large number of studies which were designed to take into account learner aptitudes that might interact with media and task characteristics.

The Cronbach-Snow review noted that G has been the most widely studied aptitude construct in instructional research and has produced the most aptitude-treatment interaction. The general hypothesis from the review is that as learners are required to puzzle things out for themselves--to organize their own study and build their own comprehension--the more able learners are capable of capitalizing on their strengths profitably. As instructional treatments were arranged to relieve learners from difficult reading, analyzing complex

concepts, and building their own cognitive structures, such treatments seemed to compensate for, or circumvent, less able learners' weaknesses and to reduce the regression slope of G. These latter treatments thus helped low G students; the high G students may or may not have done as well. Some kinds of treatment-supplied cognitive models have actually harmed high G student performance. Two studies reported by Salomon illustrate this phenomenon in instructional media research.

An early study by Salomon (1968) used a commercial film to give either "cue attendance" or "hypothesis generation" training to student teachers. The former asked the student to notice stimulus details in the film; the latter asked them to produce possible themes for the story depicted. The film scenes were shown in scrambled order to the experimental groups. A posttest was scored for information seeking (questions asked in a problem-solving transfer task about a curriculum organization problem). $G_c$ (Graduate Record Examination-Verbal Score) related to outcome positively after hypothesis generation training, but negatively after cue attendance training. Apparently, low $G_c$ students were helped by practice in attending to details, but high $G_c$ students were hurt (or bored) by this. Hypothesis generation may have required more synthesizing, which perhaps overloaded low $G_c$ students while challenging high $G_c$ students.

Salomon (1974) then investigated the effects of modeling a skill process by film. Two experiments concerned the cue-attendance skill defined in terms of both quantity of details noticed in visual displays and organization of spatial scanning (perhaps an aspect of $G_f$ and $G_v$ according to Snow, 1977). The visual displays were complex paintings. A cue attendance measure served

as both pretest and posttest, yielding quantity and organization scores. Another posttest measured information search in problem solving. In one treatment condition, a film demonstrated the processes of zooming in on close-ups of specific details one after another in sequence. Another treatment merely gave practice (called "activation") in noticing and listing details. The aptitude-treatment interactions were marked; the film model helped students initially low in cue attendance but disrupted already skilled students, who did better with simple activation. The same result occurred for the problem-solving outcome in the first experiment but not in the second (although it was measured differently). Also, in the second experiment, measures of the $G_f$ and $G_v$ cluster (field articulation) and $G_c$ (Israeli Standardized Verbal Ability Test) were included, and these gave the same aptitude-treatment interaction results as did the cue attendance pretest. Salomon hypothesized that giving high G students a processing model which they did not need caused interference with their own idiosynratic processing. He also noted the finding that scanning by able students appeared more organized after model training; they seemed to organize their search according to the model at the expense of listing details, while less able students showed the opposite pattern.

In light of the above cognitive abilities, the inquiry of this research was to determine whether there was any evidence that compositional syntactic placement was effective in improving simple concept learning from audiovisual media. This researcher was questioning whether, under the impact of different learner attributes, a particular frame position was warranted. Performance by female subjects at different levels of these cognitive abilities was investigated with an instrument which sought to isolate simple concept learning derived

from an instructional television program on women's sex roles produced in three compositional styles specifically for this study.

## METHOD

### Subjects

Female adults were chosen as the subjects, since women account for upwards to 75 percent of the participants in distance learning programs (Bryan & Forman, 1977; Zigerall, 1976). Attendees to a nonformal workshop, "Sex Roles and How to Get Out of Them," conducted in the central Georgia area served as voluntary subjects. A total of 152 women completed all portions of the experiment. Age ranged from 19 to 72 years ($M$ = 38.96, $SD$ = 10.34), and the educational level attained ranged from 10 to 19 years ($M$ = 14.04, $SD$ = 2.05).

### Materials

Stimuli. A nine-minute videotaped program entitled, "Obstacles to Career Growth--Sex Roles," was designed specifically for this experiment. The program contained ten simple concepts on sex role indicators which formed the basis for a stimuli set and for test questions. Each stimulus was constructed in three versions for left, right, and central syntactic placement by a graphic artist who controlled symbol size, color, and background. Three experimental tapes were carefully constructed with an electronic editor to ensure that each test stimulus was exactly the same length in all versions. The ten test stimuli embedded within the program were exposed on the screen from 7.66 to 13.60 seconds ($M$ = 10.72). Thus, the only difference between the left, right, and central versions of the experimental videotape was the composition of the test stimuli set.

The Criterion Tests. A pretest and posttest questionnaire was constructed from the ten sex role indicator concepts within the videotaped program. Two

multiple-choice questions with five options each were constructed for each of the simple concepts. Two additional questions were added to insure comprehension of concepts which may have been confused with definitions derived from common usage. To determine if any life-history events might have altered significantly the characteristics of the groups, true-false questions on reading sex role material and on a personal encounter with a sex-typing situation were included on the pretest. In order to reduce the length of the 22-item questionnaire to four pages, a modified matching format was utilized for the first twelve questions, since they involved definitions of concepts and attributes. The final reliability of the pretest-posttest criterion instruments determined during a pilot study was .76 as measured with the Kuder-Richardson Formula 20.

The Predictive Ability Test (PAT). The PAT was developed in response to mounting criticism of intelligence tests in the early 1970's resulting from, (a) the lack of a definition and theory of intelligence, (b) cultural bias, (c) the similarity of intelligence test to achievement tests, and (d) the reliance of intelligence tests on verbal ability (Friedman, 1974). Predictive ability is a measure of intelligence or general ability based upon the individual's aptitude to make prediction about events (Friedman, 1975; Friedman & Willis, 1981). This definition is based upon expectancy learning theory which defines learning in terms of the organizm's ability to interact with the environment. While there is relatively little agreement on a definition, it should be remembered that some very old definitions of intelligence, from Binet on, include such phrases as "adaptation to a goal," "capacity to reorganize behavior patterns for effective action," "maintenance of definite direction and concentration," "autocriticism," and in sum, "ability to learn" (Snow, 1978).

The 30-item picture instrument used to evaluate this potential is the Predictive Ability Test (Friedman, 1974). The PAT requires the respondent to make predictions about events that are common to one's everyday experience, rather than about events which are generally learned in school. Sawyer (1975) reported that test items have an average factor loading of the first priniciple axis (the predictive ability factor) of .49 with a range of from .29 to .71. The proportion of common variance accounted for the major factor in the unrotated solution (varimax rotation) was .47 with none of the other factors accounting for more than .09 of the variance. The PAT has a reliability of .90 as measured with the Kuder-Richardson 20 formula. The average difficulty index is .60 with a discrimination index of .53. During its standardization and initial study, the instrument correlated highly with different indexes of successful living: social adjustment, success in education, and job status. For the purpose of this study, the mean score for women (19) as noted by Sawyer (1975) during the test's standardization was used to separate the subjects into two relative groups: high or low ability. Subjects who scored greater than 19 were considered of high ability, and those who scored at or below 19 were considered of low ability.

Field Articulation. Messick (1976) recognized field articulation as one of the nineteen dimensions of cognitive style and defined the construct as being associated with competence at disembedding in perceptual and nonperceptual problem solving tasks. On the 18-item Group Embedded Figures Test, a field-independent person is able to locate better figures embedded in a surrounding context than is a field-dependent person (Witkin, Oltman, Raskin & Karp, 1971). Field-dependence, according to Witkin, Moore, Goodenough and Cox (1977, p. 2), "is the tendency to rely upon external referents," while "field-

independence is the tendency to rely upon internal referents." Several studies have indicated that, although field-independent and field-dependent persons are not appreciably different in learning ability or memory, field-dependent persons tend to be better at learning and remembering social material. Field-dependent individuals also are more likely to require externally defined goals and reinforcements than field-independent individuals who tend to have self-defined goals and reinforcements (Goldstein & Blackmen, 1978; Witkin, Moore, Goodenough & Cox, 1977). Furthermore, field-independent people are less inclinded to be influenced by the environment and perform well in circumstances where critical elements of a problem have to be taken out of context and restructured in a different way, such as mathematical reasoning, verbal fluency, and spatial abilities (Witkin, Moore, Oltman, Goodenough, Friedman, Owen, & Raskin, 1977). For the purpose of this study, the lower quartile women's score on the GEFT (8) was used to separate the subjects into the two relative groups: field-dependent and field-independent.

Edinburgh Handedness Inventory. The two cortical hemispheres of the human brain organize and encode information in different ways (Bogen, 1977). While there is a great deal of overlap, perceptual tasks are processed predominantly in one hemisphere, and verbal learning tasks are processed predominantly in the other hemisphere. The relationship between the preferred hand and the linguistic cerebral hemisphere is well documented (Zangwell, 1967). Virtually all right handers are left-lateralized for language, but left handers are more heterogeneous having right-lateralized language or linguistic capacity in both hemispheres (Rasmussen & Milner, 1975). Wittrock (1978) has noted that the cognitive process, and perhaps the strategies of learning may be different for nonright-handers.

The measurement of handedness is complicated and is not a clear-cut matter. The hand used in writing is one important element of handedness, but other uses of the hands are also relevant in determining handedness (e.g., eating with a spoon, throwing a ball, brushing the teeth). Oldfield (1971) selected 20 items from Humphrey's (1951) inventory and administered them to 1,128 subjects. The 20 items were subjected to an item analysis. Each item was also examined for sex, cultural, and socio-economic factors. Ten items were selected for the Edinburgh Handedness Inventory, and frequency distributions, cumulative frequencies, and a revised item analysis were reported. The final instrument had a scoring range from -100 to 100. The questionnaire yielded a bimodal, j-shaped frequency distribution with a large number of scores at the extreme right-hand pole, and a much smaller concentration of scores near the left-hand pole, representing the approximately ten percent of the population that is left-handed. White and Ashton (1976) evaluated the validity of Oldfield's instrument with factor analytic techniques. There was one major factor which could legitimately be called "handedness." For the purpose of this study, a score of 85 was selected to separate the subjects into two groups based on the bimodes occuring at the midpoints (85, 95) of the upper two class intervals. Subjects who scored greater than 85 were considered strongly right-handed and of left hemispheric dominance, and those who scored less than or equal to 85 were considered nonright-handed and of right or mixed hemispheric dominance.

Apparatus

At the front of each classroom where the workshops were held, two Sony KV-1515 Trinitron color receivers with a 32 centimeter horizontal screen width were placed for optimal subject viewing. The test stimuli videotapes were played back on Sony VP-2000 U-matic videocassette players. Utilizing an

internal radio frequency generator, the signal from the videocassette was delivered to each receiver by cable through an Archer two-way splitter and directional couple (Catalog No. 15-1141B). Color bars, audio tone, and a cross-hatch pattern recorded from a Lenco PFM-300 signal generator on the beginning of each stimulus tape were utilized to ensure that every receiver reproduced the audio and video signals accurately. Horizontal and vertical picture deflections were adjusted by a television engineer prior to the experiment so there was less than five millimeters deviation for all receivers in the classrooms.

Procedures

For this experiment, the nonequivalent-control-group design was employed (Campbell & Stanley, 1963). A total of six workshop sessions were conducted, and randomization of the experimental videotapes was utilized. A double blind technique was applied to help reduce the effect of reactive arrangements. Subjects were unaware they were participating in an experiment until the conclusion of the workshop, and the workshop leaders as well as the test administrators were unaware of which treatment was being administered. All workshop leaders had advanced degrees in counseling and guidance or clinical psychology, and all test administrators had formal instruction in testing and measurement. Three training sessions totaling over four hours were conducted for these six individuals prior to the workshop sessions.

Every workshop followed the same format. Participants were encouraged to seat themselves at the front of the classroom in order that, (a) no one be farther away than 12 times the horizontal width of the television receiver screen, and (b) a line of vision of not more than 45 degrees from the center

line axis perpendicular to the picture tube be maintained as a maximum viewing angle (Chapman, 1960). After an initial overview of the session by the trained female workshop leader, the pretest was administered and followed immediately by the syntactic visual treatment and then the posttest. This eliminated any incidental learning which might have been contributed by the discussion period which ensued. Subsequent to the discussion period and a short break, the assessment instruments were completed by the participants under the supervision of the trained female test administrator. In the final segment of the workshop, attendees were informed that group scores would be used by the Center for Continuing Education of Women at Mercer University in developing future workshops and in a study on developing videotaped materials.

## RESULTS

### Group Equivalence

Equivalence of the three combined groups ($n_{left}$ = 50, $n_{center}$ = 52, $n_{right}$ = 50) was an important question to investigate prior to testing for the experimental hypothesis, since the study utilized six intact groups, two for each of the three treatment conditions. A three level, one-way analysis of variance was used in analyzing the data between the groups for each subject background and aptitude variable: age, $F$ (2,149) = .03, $M$ = 38.96; educational level, $F$ (2,149) = 1.30, $M$ = 14.03; predictive ability, $F$ (2,149) = 1.72, $M$ = 18.49; field articulation $F$ (2,149) = .19, $M$ = 8.47; handedness $F$ (2,149) = .03, $M$ = 60.51; pretest score, $F$ (2,149) = 1.16, $M$ = 9.99). The results showed no significant differences between the groups on any of the variables at the .05 level of significance.

The two true-false questions on the pretest were analyzed using the independent samples Chi-Square Test to determine if the subjects had dissimilar

life-history experiences which might have altered the equivalence of the groups. No significant differences were noted between the groups at the .05 level for subjects having read within the last month sex role materials, $\chi^2$ (2,N=152) = .19, or having had a recent encounter with a sex-typing situation, $\chi^2$ (2,N=152) = .53. Most of the subjects responded in the negative to these two questions with 57.9% and 59.9%, respectively, circling false.

Analyses of Variance

Two, 3 X 2 X 2 unweighted means analysis of variance (ANOVA) were conducted to test the major hypotheses of the study, following the exclusion of a four-way ANOVA due to insufficient cell sizes ($n<10$). The three independent variables in the first ANOVA were compositional syntactic placement, predictive ability, and field articulation. The dependent measure was pretest-posttest difference scores. Table 1 presents a summary of the analysis.

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Insert Table 1 about here.

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The ANOVA resulted in a highly significant main effect for compositional syntactic placement, $F$ (2,140) = 19.92, $p<.0001$. A significant main effect was also achieved for field articulation, $F$ (1,140) = 6.23, $p<.05$, with field-independent subjects achieving higher mean difference scores ($M$ = 5.31) than field-dependent subjects ($M$ = 3.84). Two significant first-order interactions were observed as well, requiring caution in the interpretation of the main effects: placement by field articulation, $F$ (2,140) = 3.56, $p<.05$, and ability by field articulation, $F$ (1,140) = 9.76, $p<.01$. While not significant, the second-order interaction, placement by ability by field articulation, was at the $p$ = .10 level, $F$ (2,140) = 2.32.

Scheffé's (1953) S method was used to assess significant contrasts for the compositional syntactic placement main effect. Subjects who received the right syntactic treatment achieved a significantly greater mean difference score ($\underline{M}$ = 6.66) than either the left ($\underline{M}$ = 4.32, $\underline{p}<.01$) or the central ($\underline{M}$ = 2.60, $\underline{p}<.001$) placement groups. Subjects who received the left syntactic treatment also scored significantly higher than the central placement group ($\underline{p}<.05$).

With two significant first-order interactions and a second-order interaction approaching significance, tests of simple main effects were applied at all levels of one factor at each separate level of the other factor (Kirk, 1968) for interactions involving the three independent variables (See Table 2).

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Insert Table 2 about here.

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The test of simple main effects revealed a significant interaction at less than the .01 level for placement at field independence, $\underline{F}$ (2,140) = 16.92, and placement at field dependence $\underline{F}$ (2,140) = 8.11. Field articulation at right syntactic placement was also significant at less than the .01 level, $\underline{F}$ (1,140) = 13.09 (See Figure 1).

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Insert Figure 1 about here.

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Scheffé's S method applied to compositional syntactic placement at field independence (See Table 3) and compositional syntactic placement at field dependence (See Table 4) provided further infomation to aid in the understanding of the interaction.

Insert Table 3 and Table 4 about here.

Subjects in the field-independent, right stimulus group had a significantly higher mean difference score ($\underline{M}$ = 8.46) than those in the field-independent, central group ($\underline{M}$ = 3.26, $\underline{p}<.001$) or those in the field-independent, left group ($\underline{M}$ = 4.05, $\underline{p}<.001$). Similarly, subjects in the field-dependent right group had a significantly higher mean difference score ($\underline{M}$ = 5.00) than those in the field-dependent, central group ($\underline{M}$ =1.88, $\underline{p}<.01$); however, the mean difference score for the field-dependent, left group ($\underline{M}$ = 4.54) only approached significance from the field-dependent, central group. Thus, a disordinal interaction occurred for the left stimulus group. Field-dependent participants had higher mean pretest-porttest difference scores than field-independent subjects in the left stimulus group. contrary to the other two groups where field-independent subjects scored higher.

The difference in gain scores was significant for high and low ability subjects when considering their field articulation. The test of simple main affects revealed a significant interaction at less than the .05 level for ability at field independence, $\underline{F}$ (1,140) = 6.62, and a significant interaction at less than the .01 level for field articulation at low ability, $\underline{F}$ (1,140) = 16.01 (See Figure 2).

Insert Figure 2 about here.

low ability, field independent subjects had a significantly higher mean difference score ($\underline{M}$ = 6.18) than either their low ability, field-dependent counterparts

($\underline{M}$ = 3.06) or high ability, field-independent subjects ($\underline{M}$ = 4.40), but they did not differ significantly from high ability, field-dependent subjects ($\underline{M}$ = 4.75).

Though not significant ($\underline{p}$ = .10), a graph of the placement by ability field articulation interaction will ameliorate our understanding of the experimental variables effect (See Figure 3).

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Insert Figure 3 about here.

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For the low ability, field-independent subject, these data showed that right syntactic placement was superior to the other two orientations. High ability, field-independent and high ability, field-dependent subjects also performed superiorly in the right syntactic placement group. The performance of the low ability, field-dependent subject was an entirely different matter. These subjects performed better in the left syntactic placement group. Notice that the graph represented in Figure 3 for the central and right syntactic groups mirrored the ability by field articulation interaction presented in Figure 2 (though at a wider angle), whereas the graph for the left syntactic placement group was exactly the 180 degree inverse of Figure 1. Unfortunately, this second order interaction only had limited support.

A second three-way ANOVA was conducted to investigate the question of hemispheric dominance. The three independent variables were compositional syntactic placement, predictive ability, and handedness. The dependent measure was, again, pretest-posttest difference scores. Table 5 presents a summary of the analysis.



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Insert Table 5 about here.

Nonright-handed subjects (right or mixed hemispheric dominance) were aided by the left syntactic treatment ($M$ = 4.65) more so than their strongly right-handed (left hemispheric dominance) counterparts ($M$ = 3.96), but strongly right-handed subjects were helped by the right syntactic treatment ($M$ = 7.27) more so than their nonright-handed counterparts ($M$ = 6.18). The central syntactic group followed a similar pattern to the right syntactic group. Right-handed subjects were assisted by the central placement ($M$ = 7.27), but nonright-handed subjects were not ($M$ = 6.17). While the left syntactic treatment favored nonright-handed subjects of right or mixed hemispheric dominance and the central and right syntactic treatments favored right-handed subjects of left hemispheric dominance, the difference did not approach significance at the $p$ = .05 level.

## DISCUSSION

The syntactic placement of visual symbols within a videotaped presentation was shown to increase concept learning for female adults, regardless of whether the symbol was in the left or right orientation; however, the right syntactic placement was predominantly superior. This effect for placement was not to be expected based on previous research, since six of the seven aesthetic studies reviewed dealing with syntactic placement found no significant difference. The one study (Metallinos, 1980) that reported significant differences found that subjects were better able to describe the shape and to recall the stimuli placed on the left side of the screen better than those placed on the right. Of those studies reporting trends, Metallinos (1975) and Metallinos and Tiemens

(1977) reported that retention of visual (but not verbal) information in a newscast was enhanced by placement on the left side of the screen, while Niekamp (1981) reported that mean fixations of test stimuli measured by ocular photography favored the right. Hence, limited support favored the left orientation in dual comparisons (left vs. right placement), but a more accurate method of measurement indicated the right orientation.

With the exception of the Metallinos and Metallinos-Tiemens studies, none of the experiments attempted to evaluate learning effects, and these researchers reported no significant difference. In the present study, the use of left syntactic placement increased simple concept learning by 66 percent over the central syntactic treatment. However, right syntactic placement increased simple concept learning by 156 percent over the central orientation and 54 percent over the left orientation. These results suggest that use of right or left compositional syntactic placement might be a valid procedure for increasing conceptual knowledge resulting from the viewing of a videotaped presentation. The discrepancey between these results and the previous studies may be explained most simply by the less distinctive visuals utilized in the previous experiments, such as the generic visuals of a newscast (e.g., themis for law stories, the caduceus for medical stories) or the more universal visuals of exploratory aesthetic research (e.g., circles, pastoral scenery). Metallinos (1975) and Metallinos and Tiemens (1977) noted this possibility as well and called for additional research with more complex stimuli.

In regard to learner aptitudes, results from the pretest-posttest difference scores confirmed that learners with field-dependent aptitude have difficulty with externally-paced concept attainment tasks which require the ability to

discriminate essential information (Dickstein, 1968; Kirschenbaum, 1968; Witkin, Moore, Goodenough & Cox, 1977). The intent of this study was not to depict the field-independent subject as a more highly skilled or "better" learner. Nevertheless, it is likely that performance on many concept attainment tasks may be facilitated by a more differentiated, field-independent strategy. Concept learning may be hampered by an extreme field-dependent orientation when relevant cues are not salient and when instructional time is limited by fixed-paced presentations.

Field-independent subjects' performance on mean gain scores was highly facilitated through the use of right syntactic placement as opposed to central or left syntactic placement. Field-dependent subjects' performance was similarly influenced by visual orientation, but not to the same level of performance. This finding was in agreement with that of Frederick (1968) who found that only more analytic learners were sensitive to amounts of relevant information and with that of Salomon (1974, 1979) who observed that modeling cue attendance favored only the highly field-independent learners. It appears possible that right compositional syntactic placement decreased abstraction time and processing effort which permitted more efficient and effective processing by both field-independent and field-dependent subjects, though field-dependent individuals may still have had greater difficulty in isolating relevant information. Evidently, right syntactic placement did not provide adequate supplantation to overcome totally their processing difficulties which were evident in the pretest-posttest gain scores. Perhaps, other combined functional attributes were needed to provide a more powerful cue-summation effect for field-dependent learners to supplant their processing weaknesses.

In light of an aptitude interconnection or aptitude complexes explanation, the findings from the two-way interaction of predictive ability and field articulation warrant consideration. While predictive ability did not interact with compositional syntactic placement as visual modeling of a mental skill (cue attendance) interacted with general ability in Salomon's (1968, 1974, 1979) studies, the resulting two-way trait interaction suggested that certain combinations of ability and field articulation may have differentially affected learner outcomes. Although the right compositional syntactic placement facilitated simple concept learning for all field-articulate learners, the two-way interaction of variables implied that a specific placement condition may provide effective compensatory supplantation for high ability, field-dependent learners. Futhermore, a different placement condition may also function to activate highly the appropriate processing modes of the low ability, field-independent learners.

Limited support for this interpretation is provided further by the three-way interaction of field articulation, predictive ability, and compositional syntactic placement ($p = .10$). The utilization of right syntactic placement appeared to reduce processing and time demands which functioned to isolate, emphasize, and organize relevant information for the high ability, field-dependent learner. In fact, this orientation provided superior cue-summation for all but the low ability, field-dependent learner. Apparently, the right orientation added slightly to the processng demands of the low ability, field-dependent learner, whereas the left orientation aided this learner by isolating and directing attention to relevant concept details. The left treatment condition was the only one which the low ability, field-dependent subjects outperformed their high ability, field-dependent counterparts. The other variable of interest in this study, hemispheric dominance, did not explain

this performance convergence, despite Levy's (1976) finding of a preference for self-reported right-handers (left hemispheric dominance) for the right visual field. While self-reporting techniques are prone to error, presumably, measurement difficulties precluded an accurate evaluation of this trait, or other spatial-logical analytic attributes were intervening.

The general superiority of compositional syntactic placement may be taken as substantial support for Salmon's (1979) supplantation theory, where the choice of specific coding elements within a symbol system may effect the ease with which information is processed by a learner. These external stimulus cue summations may have increased both learning efficiency and effectiveness by reducing the number of possible hypotheses (Pishkin, 1965), which may be helpful in reducing the memory demands associated with field-dependent hypothesis-testing strategies (Mayer, 1977). By providing ready-made transformations, the instructional materials may have compensated for the learner's deficiency by providing a mode of presentation that the learner could not provide (Snow, 1970). In other words, the compensatory treatments achieved for the learners what they could not do for themsleves because of a particular aptitude weakness in discriminating relevant cues (Salomon, 1972).

This research has opened the door to the study of media attributes or coding systems and their relation to adult learner attributes. Cronbach and Snow (1977) have suggested that the design of instruction should be selective according to aptitude. Their emphasis is directed towards the choice of appropriate instructional techniques, rather than to the selection of a medium as an invariant entity. This view is particularly appropriate when considering the implications for instructional practice suggested by this study. First, the results suggest practical recommendations in terms of the specific processes

reflected by field-dependent and field-independent learners when dealing with compositional syntactic placement in kinetic media. Second, the findings support the view that the design in instruction should be selective according to aptitude because of cognitive style differences in processing information on a simple concept attainment task. Although the same compositional syntactic treatments often facilitated both field-dependent and field-independent performance, one important implication should not be overlooked. While the effective treatments permitted field-independent individuals to perform more successfully, for the field-dependent learners, these same treatments may have been of critical importance in reaching a criterion of success. As expected, field-dependent individuals appeared to be handicapped in reaching higher levels of concept attainment. The effective treatments may have been imperative for acceptable performance by field-dependent learners who may have needed specific supplantation in order to meet a basic performance criterion.

This study has indicated more research is warranted in the area of aptitude capacities of the learner and the attributes of kinetic media, particularly in the area of symbol systems. In addition to compositional syntactic placement or asymmetry of the screen, Zettl (1973) has recognized other coding systems within the frame: main direction of horizontal and vertical orientations, attraction of symbol mass, figure/ground relationships, psychological closure, and vectors or directional lines as well as movement. Kjørup (1977) and Metz (1974) have identified syntaxes beyond the level of the shot with shots forming sequences, sequences forming syntagms, and syntagms forming the whole program. The systematic study of these media attributes may establish a solid structure upon which instructional programs may be built, especially when learner traits are used in the measurement.

Of immediate interest is the consideration of the learners ability. The limited support offered from the ability by field articulation by compositional syntactic placement interaction in this study dictates further investigation. Perhaps, the low and high ability dimensions were too gross to detect the subtle interplay of the aptitude's effect. A replication of the study with low, intermediate, and high ability may ferret out more reliably any potential difference.

Additional research is warranted also in the area of hemispheric dominance and media attributes. While mean differences were noted in the hypothesized direction, no significant differences were obtained. Unfortunately, the measurement of handedness as an indication of degree of lateralization is not a clear-cut matter. Kinsbourne and Hiscock (1978) note that dichotic listening and half-field tachistoscopic tasks provide a more direct assessment of cerebral lateralization; however, there is considerable diversity of opinion concerning the appropriate statistical treatment of the scores. In addition, these two tests are difficult to administer to large groups. Investigatory work must first focus on developing a more reliable and easily administerable measure of lateralization before studies can proceed with interaction effects on media attributes.

Until such time as the issue of laterality measurement is settled, more fruitful research may result from the intercorrelational aptitude paradigm of Snow (1980). Snow notes the relation of crystallized ability ($G_c$)--a constellation of measures of verbal knowledge, reading comprehension, and prior educational achievement--to learning outcomes is strongest in conventional instructional treatments. When such an instructional treatment is modified to reduce the need for conventional assembly and control process, the relation of $G_c$ to

learning outcomes goes down. Fluid ability skills ($G_f$)--a constellation consisting of abstract and often nonverbal reasoning tests and some spatial and figural tests--should relate to learning outcomes under instructional conditions that are in some sense new, unlike those that the individual learner has faced in the past. Ability to apply previously crystallized learning skills ($G_c$) would not be relevant here, but ability to adapt to new kinds of learning or performance requirements ($G_f$) would be relevant. Snow (1980, p. 59) predicts:

> ...that as an instructional situation involves combinations of new technology (e.g., computerized instruction or television), new symbol systems (e.g., computer graphics or artistic expression), new content (e.g., topological mathematics or astrophysics), and/or new contexts (e.g., independent learning, collaborative teamwork in simulation games), $G_f$ should become important and $G_c$ less important.

The distinction between "visualization" ($G_v$)--a constellation of figural and spatial relations tests in which field articulation is frequently included--and $G_f$ is often difficult to make, because they appear separable in multidimensional scaling but not in factor analysis. $G_f$ and $G_v$ are separable at times, with some measures, and in some populations. Often, however, the close correlation between measures from each constellation suggests that some individuals, or all individuals, sometimes use $G_f$ processes to perform $G_v$ tasks. Again it may be individual differences in the novel assembly and control of spatial processing that underlie this relation, rather than a basic relation between fluid-analytic and spatial performance processes. Therefore, $G_f$ tests that measure to a greater degree the kinds of assembly and control processes needed to organize on a short-term basis adaptive strategies for solving novel problems should be included in studies on interaction effects of learner and media attributes.

With the increased utilization of television and videotaped programs in adult education to reach new student populations, the developed learning procedures need to acknowledge the relationship between the processing capacity of the learner and the processing demands of the media task. Consequently, adult educators should tailor materials to fit the aptitude predispositions of learners. In so doing, they may promote a regard for the individual that is made possible through aptitude-sensitive instruction. Aptitude-sensitive instruction places emphasis on the single most important component of any educational experience--the learner. By following this strategy, adult educators will be assisted in removing barriers to diverse learning tactics, in encouraging people to take responsibility for learning, and in promoting lifelong learning. This study has taken a preliminary step into the arena of questions regarding the impact of media attributes on aptitude capacities of the adult learner. The results of this initial venture fostered more questions than answers. Nevertheless, this initial effort has served to bring into focus the important issue of learner interaction with media attributes for adult education.

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TABLE 1

COMPOSITIONAL SYNTACTIC PLACEMENT X ABILITY X FIELD ARTICULATION
SUMMARY OF THREE-WAY ANALYSIS OF VARIANCE

| Source of Variation | SS | df | MS | F |
|---|---|---|---|---|
| Compositional Syntactic Placement (P) | 453.99 | 2 | 227.00 | 19.92*** |
| Ability (A) | .07 | 1 | .07 | .01 |
| Field Articulation (F) | 71.04 | 1 | 71.04 | 6.23* |
| P X A | 4.38 | 2 | 2.19 | .19 |
| P X F | 81.12 | 2 | 40.56 | 3.56* |
| A X F | 111.22 | 1 | 111.22 | 9.76** |
| P X A X F | 52.82 | 2 | 26.41 | 2.32 |
| Error | 1595.32 | 140 | 11.40 | |

*$p < .05$
**$p < .01$
***$p < .0001$

TABLE 2

SIMPLE MAIN EFFECTS ANALYSIS OF VARIANCE

| Source of Variation | SS | df | MS | F |
|---|---|---|---|---|
| Compositional Syntactic Placement (P) | 453.99 | 2 | 227.00 | 19.92 |
| P at $F_I$ | 385.82 | 2 | 192.91 | 16.92** |
| P at $F_D$ | 184.94 | 2 | 92.47 | 8.11** |
| Ability (A) | .07 | 1 | .07 | .01 |
| A at $F_I$ | 75.42 | 1 | 75.42 | 6.62* |
| A at $F_D$ | 40.84 | 1 | 40.84 | 3.58 |
| Field Articulation (F) | 71.04 | 1 | 71.04 | 6.23 |
| F at $A_H$ | 3.47 | 1 | 3.47 | .30 |
| F at $A_L$ | 182.46 | 1 | 182.46 | 16.01** |
| F at $P_L$ | 2.96 | 1 | 2.96 | .26 |
| F at $P_C$ | 24.69 | 1 | 24.69 | 2.17 |
| F at $P_R$ | 149.26 | 1 | 149.26 | 13.09** |
| P X A | 4.38 | 2 | 2.19 | .19 |
| P X F | 81.12 | 2 | 40.56 | 3.56 |
| A X F | 111.22 | 1 | 111.22 | 9.76 |
| P X A X F | 52.82 | 2 | 26.41 | 2.32 |
| Error | 1595.32 | 140 | 11.40 | |

*$p < .025$
**$p < .001$

Note. F ratios were tested at the $\alpha/q$ level of significance, where q equals the number of variance levels (Kirk, 1968).

TABLE 3

RESULTS OF SCHEFFÉ'S S METHOD OF ANALYSIS FOR COMPOSITIONAL SYNTACTIC PLACEMENT AT FIELD INDEPENDENCE

| Group | Field-Independent Right | Field-Independent Left | Field-Independent Center |
|---|---|---|---|
| n | 24 | 22 | 27 |
| $\bar{X}$ | 8.46 | 4.05 | 3.26 |

TABLE 4

RESULTS OF SCHEFFE'S S METHOD OF ANALYSIS FOR COMPOSITIONAL SYNTACTIC PLACEMENT AT FIELD DEPENDENCE

| Group | Field-Dependent Right | Field-Dependent Left | Field-Dependent Center |
|---|---|---|---|
| n | 26 | 28 | 25 |
| $\bar{X}$ | 5.00 | 4.54 | 1.88 |

TABLE 5

COMPOSITIONAL SYNTACTIC PLACEMENT X ABILITY X HANDEDNESS
SUMMARY OF THREE-WAY ANALYSIS OF VARIANCE

| Source of Variation | SS | df | MS | F |
|---|---|---|---|---|
| Compositional Syntactic Placement (P) | 447.19 | 2 | 223.60 | 16.74*** |
| Ability (A) | .01 | 1 | .01 | .00 |
| Handedness (H) | 2.50 | 1 | 2.50 | .19 |
| P X A | 5.23 | 2 | 2.62 | .20 |
| P X H | 14.63 | 2 | 7.32 | .55 |
| A X H | 11.22 | 1 | 11.22 | .84 |
| P X A X H | 32.03 | 2 | 16.02 | 1.20 |
| Error | 1869.69 | 140 | 13.35 | |

***p < .0001

FIGURE 1

FIRST-ORDER INTERACTION OF VISUAL GROUPS BY FIELD ARTICULATION ON MEAN GAIN SCORES OF PREDICTIVE ABILITY

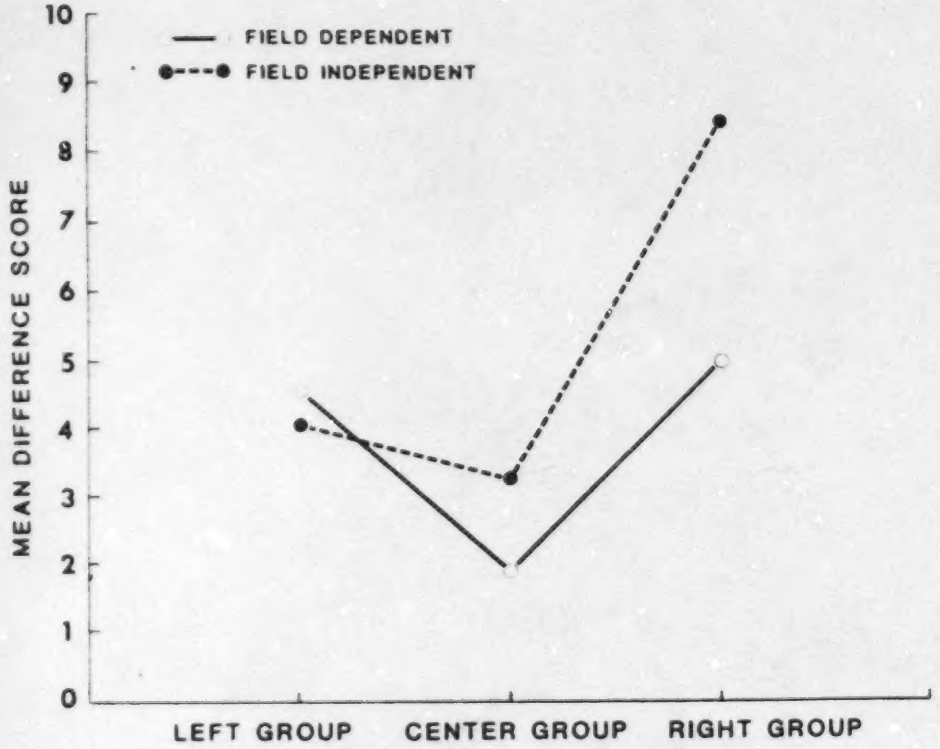

FIGURE 2

FIRST-ORDER INTERACTION OF PREDICTIVE ABILITY BY FIELD ARTICULATION ON MEAN GAIN SCORES OF VISUAL GROUPS

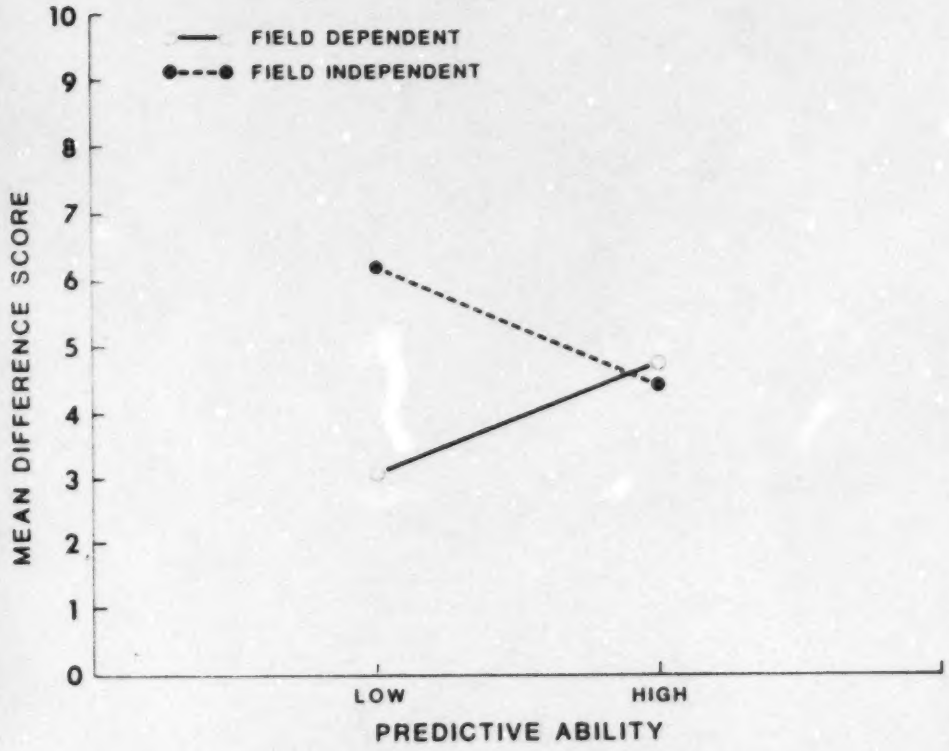

FIGURE 3

SECOND-ORDER INTERACTION OF VISUAL GROUPS BY FIELD ARTICULATION BY PREDICTIVE ABILITY ON MEAN GAIN SCORES